Week 4 Questions

1. All are true of the Pentose Phosphate Pathway EXCEPT:
   1. Has an oxidative and non-oxidative phase
   2. Is found in the liver, adipose tissue, and the adrenal cortex
   3. Generates reducing power using NADH
   4. Both B and C
   5. None of the above
2. Which of the following products of the PPP are also found in glycolysis:
   1. 3-Phosphoglycerate
   2. Glyceraldehyde-3-phosphate
   3. Ribose-5-phosphate
   4. Fructose-6-phosphate
   5. Both B and D
   6. All of the above
3. A patient came into your clinic for a routine check-up. The patient admits to you that he is an alcoholic, but is trying to overcome the problem. From your knowledge in medical school, you immediately think he may have Wernicke-Korsakoff disease and thus a thiamine deficiency. You decide to do a simple procedure to test for thiamine deficiency which includes giving thiamine and then measuring the activity of what enzyme:
   1. Leukocyte transaldolase
   2. Adipose hormone sensitive lipase
   3. Erythrocyte transketolase
   4. Both A and C
   5. None of the above
4. What is the number of carbon fragments that are transferred by transketolase and transaldolase, respectfully:
   1. C2 and C3
   2. C4 and C5
   3. C1 and C3
   4. C5 and C6
5. Choose the correct statement:
   1. Muscle relaxation is an active process
   2. Calcium is pumped back into the SR by way of a Ca+2/ATPase
   3. ATP is needed to break the rigor complex
   4. Both A and B
   5. All of the above
6. A patient comes into the hospital complaining of muscle weakness. You do a simple test where you have the patient look up for as long as they can, and you notice after a short period of time, the patient’s eye lids begin to droop. Following this, you do a blood test and find that there are antibodies attacking the patient’s ACh receptors at the NMJ. You conclude that the patient has Myasthenia Gravis. What are some treatment options you have to help the patient cope with this disease:
   1. Immunosuppressants
   2. Vincristine
   3. Coumadin
   4. AChE inhibitors
   5. Both A and D
   6. None of the above
7. All of the following are true EXCEPT:
   1. After being pumped back into the SR, Ca+2 binds to IP3
   2. ADP and P bind to the head region of the myosin light chain
   3. ACh is released in vesicles from the motor axon terminal
   4. Both ligand-gated and voltage-gated Na+ channels open during depolarization of the sarcolemma
8. A pediatric cardiothoracic surgeon must be able to perform small movements and have very fine control of his hand muscles during surgery. From this information alone, you could suspect that the surgeon has:
   1. A small number of horizontally oriented muscle spindle fibers
   2. A large number of longitudinally oriented muscle spindle fibers
   3. A larger number of serotonin receptors at the NMJ
   4. Unmyelinated motor axons along which the nerve impulse is generated
   5. Both C and D
9. Linolenate can be abbreviated by:
   1. 14:0
   2. 20:4 (5,8,11,14)
   3. 18:2 (9,12)
   4. 18:3 (9,12,15)
   5. None of the above
10. A mother brings her 1 year old child into the ER. The child was very lethargic and the mother explained how he had vomited several times since dinner. You have an idea that it could be medium chain acyl-CoA dehydrogenase deficiency (MCAD) so you order a urine test. The test comes back showing MCFA esters of glycine and carnitine in the urine, confirming your original thought of MCAD. The proper treatment for this disease is:
    1. Treat with IV protein, followed by high fat, low carb diet
    2. Treat with IV glucose, followed by high fat, low carb diet
    3. Treat with IV glucose, followed by high carb, low fat diet
    4. Administer antibiotics, followed by high protein diet
11. What is the total number of ATP generated from the oxidation of myristate:
    1. 88
    2. 90
    3. 92
    4. 94
    5. 96
12. All of the following are true EXCEPT:
    1. Acyl-CoA synthetase is used to add CoA onto the fatty acid
    2. Fatty acids have to use carnitine acyltransferases to cross into the mitochondria
    3. The 4 steps in β-oxidation of FA’s is oxidation, hydration, oxidation, reduction
    4. Acyl-CoA dehydrogenase is enzyme used in step 1 of β-oxidation of FA’s
    5. The acyl-CoA molecule is shortened by 2 carbons after each cycle through β-oxidation
    6. None of the above
13. Besides the mitochondria, FAs can also be oxidized in:
    1. Peroxisomes
    2. Golgi apparatus
    3. Smooth ER
    4. Lysosomes
    5. None of the above
14. Which of the following is NOT true:
    1. Cardiac muscle has larger T-tubules than skeletal muscle
    2. Most of the Ca+2 in cardiac muscle comes from being stored in the large terminal SR
    3. Cardiac T-tubules surround myofibrils at the Z-line
    4. The force of contraction in cardiac muscle is nearly linearly related to the amount of Ca+2 entry
    5. None of the above
15. Which of the following is true of cardiac muscle?
    1. It is the most efficient at extracting O2 from RBC
    2. T-tubules and the terminal SR make a tetrad appearance when cut in cross section
    3. Myocytes rotate their orientation throughout the wall of the myocardium
    4. The rate of contraction is controlled by the vagus nerve
    5. A, C, and D
16. All of the following is true of smooth muscle EXCEPT:
    1. It is important in regulating digestion, respiration, and blood flow
    2. It contains the intermediate filaments desmin, vimentin, and dystrophin
    3. It contains the thin filaments actin, troponin, and tropomyosin
    4. Both B and C
    5. None of the above
17. Choose the correct statement about smooth muscle:
    1. Actin binds to areas on the myosin thick chain during contraction
    2. There are no terminal SR cisternae, thus Ca+2 is completely derived from outside the cell
    3. The ratio of actin/myosin is greater than in skeletal and cardiac muscle
    4. Myosin light-chain kinase dephosphorylates the myosin allowing actin to bind
    5. Both A and B
    6. A, B, and C
18. All of the following are true concerning the metabolism of fructose EXCEPT:
    1. Fructokinase places a phosphate group on fructose
    2. The absence of aldolase B causes a buildup of fructose-6-P in the liver
    3. The absence of fructokinase causes fructose uria
    4. The metabolism of fructose takes place mainly in the liver
    5. None of the above
19. Which of the following are true concerning the metabolism of galactose:
    1. Hexokinase adds a phosphate group on galactose
    2. Galactose-1-Phosphate uridyl transferase creates UDP-galactose from galactose-1-P and UDP-glucose
    3. UDP-galactose is converted to UDP-glucose by uridine diphosphogalactose-4-epimerase
    4. Both B and C
    5. All of the above
20. A mother brings her sick infant into the hospital. As a resident, you notice the infant has a slight yellow appearance, and after doing stomach palpations, also has an enlarged liver. The mother also explains every time after she breastfeeds the infant, he vomits. From these symptoms and observations, you conclude the infant has galactosemia. Galactosemia is caused by:
    1. A buildup of galactose-6-phosphate in the liver
    2. A buildup of glucose-1-phosphate in the liver
    3. The absence of galactose-1-phosphate uridyl transferase
    4. Both A and C
    5. None of the above
21. All of the following are true of neurons EXCEPT:
    1. They do not have the capacity to divide
    2. They can have voltage gated and ligand gated membrane channels
    3. They are a common sources of tumors in the CNS
    4. They can be unipolar, bipolar, pseudounipolar, or multipolar
    5. None of the above
22. Choose the correct statement
    1. Neurons renew 1/3 of their protein each day
    2. Fast anterograde axoplasmic transport utilizes dynein as the molecular motor
    3. 1 Schwann cell myelinates several PNS axons while 1 Oligodendrocyte myelinates 1 CNS axon
    4. All axons are ensheathed by cytoplasmic processes of glia cells
    5. Both A and D
    6. All of the above
23. Which of the following are true regarding chemical synapses:
    1. The ends of the axon form an enlarged bulb called the synaptic bouton
    2. The pre and postsynaptic density are of equal thickness in a symmetric synapse
    3. Synaptic densities are usually called “active zones”
    4. Flattened clear synaptic vesicles usually release inhibitory neurotransmitters (i.e. GABA)
    5. Both A and C
    6. All of the above
24. All of the following are true of neuroglia in the CNS EXCEPT:
    1. They are important in K+ buffering and myelin formation
    2. Microglia contain a lot of RER and ribosomes
    3. Protoplasmic astrocytes are associated with gray matter
    4. Only A and C
    5. All of the above
25. Choose the correct statement about nerve degeneration:
    1. In retrograde axonal degeneration, the distal portion of the axon from the site of injury to the tip is degraded
    2. In Wallerian degeneration, the proximal portion of the axon degenerates back towards the cell body
    3. In Chromatolysis, the cell body hypertrophy’s, the nucleus moves to an eccentric location, nissl substance becomes dispersed, and an increase in protein synthesis occurs
    4. Both A and B
    5. All of the above
26. Choose the correct statement about muscle pennation:
    1. Non-pennated muscle does not lose force due to the pennation
    2. Pennated muscle has a greater number of muscle fibers
    3. Your gastrocnemius is an example of a bipennated muscle
    4. Your bicep is an example of non-pennated muscle
    5. Both A and C
    6. All of the above
27. Which of the following are true regarding knee extensors:
    1. An angle of 60-70 degrees produces the most muscle force
    2. They are your hamstring muscles
    3. An angle of 30 degrees produces the most muscle force
    4. Both B and C
    5. None of the above
28. All of the following are true regarding type II muscle fibers EXCEPT:
    1. Endurance training causes a change from IIa IIb
    2. They greatly outnumber type I fibers in individuals with a spinal cord injury (SCI)
    3. They produce a greater muscle force than type I fibers
    4. They make up slow motor units
    5. Both A and D
    6. All of the above
29. Over a long weekend, you decide to visit your grandmother in the nursing home. Upon arrival, you suggest walking outside to enjoy the weather; however she declines, claiming she is tired. A nurse pulls you aside and informs you that she has been bedridden for the last month or two and cannot walk very well. From your medical knowledge, you know muscles are susceptible to atrophy as one ages or due to inactivity. If you were to ask the nurse to be sure certain muscle(s) are exercised to prevent atrophy, which would you recommend?
    1. Knee flexors
    2. Knee extensors
    3. Plantar flexors
    4. Dorsi flexors
    5. Both B and C
    6. Both B and D
30. Which of the following regarding muscle twitch is correct:
    1. It is a result of rapidly stimulating the muscle many times until the force plateaus
    2. It contains a latent period which is related to Ca+2 being release from the SR
    3. The muscle force summates until it reaches a peak level
    4. It contains a relaxation period which is related to Na+ being pumped back into the SR
    5. None of the above
31. Choose the incorrect statement about fatty acid synthesis:
    1. It occurs in the cytosol
    2. The 4 steps are: condensation, oxidation, hydration, oxidation
    3. NADPH is oxidized
    4. The substrate is malonyl-CoA
    5. None of the above
32. All of the following are true regarding the activation stage of FA synthesis EXCEPT:
    1. The rate-limiting enzyme is acetyl-CoA carboxylase
    2. The reaction usually occurs after exercise or during fasting
    3. The enzyme uses Biotin as a cofactor
    4. The reaction synthesizes malonyl-CoA from acetyl-CoA
    5. Both B and C
33. Which statement about the enzyme ATP citrate lyase is true:
    1. It’s the enzyme responsible for the dehydration reaction in FA synthesis
    2. It catabolyzes a reaction that takes place in the mitochondria
    3. It’s responsible for converting oxaloacetate to citrate
    4. It is active when energy/glucose levels are high
    5. None of the above
34. A mother brings her infant into the ER, claiming he is not growing at a normal pace, has many skin abnormalities, and is always sick. After running some tests, you conclude the infant has essential fatty acid deficiency and you treat the infant with essential FA such as linoleate and linolenate. Why are linoleate and linolenate considered essential FA?
    1. Mammalian cells can’t introduce double bonds past C6 in the mitochondria
    2. Mammalian cells can’t introduce double bonds past C9 in the ER
    3. Mammalian cells can’t introduce double bonds past C12 in the mitochondria
    4. Mammalian cells can’t introduce double bonds past C15 in the ER
    5. None of the above
35. Which of the following is a correct series of steps in the regulation of acetyl-CoA carboxylase (ACC) when starvation is occurring? (some steps may be skipped)
    1. Glucagon/epinephrine is released🡪Protein kinase A and adipose lipolysis are stimulated🡪Protein kinase A inhibits protein phosphatase 2A and FA oxidation occurs🡪an AMP activated protein kinase is activated and phosphorylates ACC 🡪 ACC is inactivated🡪FA synthesis is inhibited
    2. Glucagon/epinephrine is released 🡪 Protein kinase A and adipose lipolysis are inhibited 🡪 protein phosphatase 2A is activated🡪ACC is phosphorylated by AMP activated protein kinase🡪 ACC is inactivated🡪FA synthesis is inhibited
    3. Insulin is released🡪Protein phosphatase 2A is activated🡪ATP is available and thus inhibits AMP activated protein kinase🡪 ACC is dephosphorylated🡪 ACC is activated🡪FA synthesis occurs
    4. Insulin is released🡪Protein phosphatase 2A is inhibited🡪Adipose lipolysis is activated and FA oxidation occurs🡪 Protein kinase A phosphorylates ACC🡪ACC is inactivated🡪FA synthesis is inhibited
36. All of the following are true regarding fatty acid mobilization for energy EXCEPT:
    1. It occurs during times of starvation
    2. Lipoprotein lipase is used to break down TG into FFA and glycerol
    3. FFA are transported in the blood by albumin
    4. FFA travel to other tissues for oxidation
    5. None of the above
37. Choose the correct statement about the digestion and transport of dietary triglycerides:
    1. Pancreatic lipase breaks down triglycerides in the stomach
    2. Triglycerides are transported by way of chylomicrons directly to the blood
    3. Once in the blood, triglycerides are carried to adipose and muscle tissue
    4. Triglycerides are broken down and re-synthesized in mucosal cells
    5. All of the above
38. Choose the correct statement regarding triacylglyceral biosynthesis:
    1. It occurs mainly in muscle
    2. The second acyl-CoA is usually saturated
    3. An acyl group is added to lysophosphatidate to form diacylglycerol
    4. Both B and C
    5. None of the above
39. Which of the following are true regarding acetoacetate:
    1. The heart prefers it over glucose for energy
    2. It can form acetone by a spontaneous decarboxylation
    3. It can be converted to acetyl-CoA and go through the TCA cycle in all tissue
    4. Both A and B
    5. All of the above
40. All of the following are characteristic of an untreated diabetic EXCEPT:
    1. Inhibited carnitine acyl transferase
    2. Acetone breath due to buildup of ketone bodies in the lungs
    3. Increased glucagon and epinephrine release
    4. Increased acetyl-CoA converted to acetoacetate
    5. None of the above

Answers on next page

* + - 1. C 11. C 21. C 31. B
      2. E 12. C 22. E 32. B
      3. C 13. A 23. F 33. D
      4. A 14. B 24. B 34. B
      5. E 15. E 25. C 35. A
      6. E 16. D 26. F 36. B
      7. A 17. F 27. A 37. C
      8. B 18. B 28. E 38. E
      9. D 19. D 29. E 39. D
      10. C 20. C 30. B 40. A